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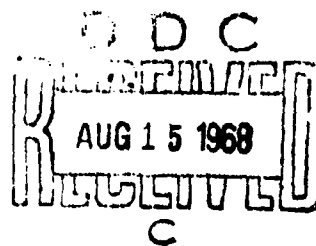
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REPORT ON STAPHYLOCOCCUS ENTEROTOXINS

[Following is a translation of an article by Hans-Philipp Pohn and Malte Kienitz in the German-language periodical Zentralblatt für Bakteriologie (Central Journal of Bacteriology), Vol 177-178, pages 555-559.]

4. Research on Staphylococcus Strains From Pyogenic Diseases and Healthy Carriers

Submitted for publication 27 July 1959.

In an earlier contribution Kienitz and Preuner (1959) reported on the possibility of detecting staphylococcus enterotoxin in incubated hen's eggs. Using the procedures described in this work, tests were made on 101 staphylococcus strains, 52 of which were from pyogenic illnesses and 49 from personnel (healthy carriers) and investigated material. In these tests, 12 strains were found that may very well produce thermostable enterotoxin on the basis that they were deposited by chick embryo tests. None of these strains have, however, led to the clinical appearance of enterotoxiosis. Even though there has been a relatively small number of cultures investigated it still appears to be of interest to analyze epidemiologically the lysogeny of these staphylococci strains.

The lysogenic investigation was carried out according to the recommendations of the International Committee on Bacteriophage Typing of Staphylococci (see Anderson and Williams 1956; Brandis 1957; Pohn 1955 and 1958). Strains which could not be typed with the test phages were retested with supplementary phages. In this manner a phage composition of 100 out of 101 strains could be worked out.

The distribution among lysogenic groups of the strains investigated is presented in Table 1.

Table 1
Lysogenic Group Distribution of 101 Staphylococcus Strains

| Lysogenic Group | Pediatric clinic | Surgical clinic | Total |
|-------------------|------------------|-----------------|-------|
| I | 45 | 19 | 64 |
| II | 8 | - | 8 |
| III | 8 | 9 | 17 |
| IV | - | 1 | 1 |
| M (miscellaneous) | 1 | 2 | 3 |
| Atypical | 2 | 5 | 7 |
| Indeterminable | 1 | - | 1 |
| Total | 65 | 36 | 101 |

This demonstrates that this frequency distribution corresponds to the results of earlier investigations in Germany (Pohn 1955 and 1958; Ortel 1957). A definite type predominates neither in the pediatric or surgical clinic. It is concluded as a result, that the investigated strains are not the result of chance infections (cross infections, hospitalism) but are more likely the strains of introduced infections, or individual strains of healthy carriers.

The 12 enterotoxin producers detected are itemised in Table 2 with their phage compositions; Table 3 compares the frequency distribution of the 12 investigated enterotoxin strains. A distinction is made here between the staphylococci isolated from pyogenic diseases and strains from healthy carriers or investigated material (dust). According to earlier observations (Allison 1949; Williams, Rippon, and Dowsett 1953) the enterotoxin producers belong mainly to lysogenic group III. The two staphylococci strains indicated as atypical were in phages of lysogenic group III. It is concluded in typing the individual colonies that a mixture culture of various phages exists here.

Table 2
Enterotoxin Producing Strains

| No. | Source | Lysogenic group | Phage composition |
|------|---------------------------------------|-----------------|--------------------------|
| 9. | Pediatric Clinic, Healthy Carriers | III | 6/7/47/53/54/75 |
| 10. | Pediatric Clinic Healthy Carriers | II | 3A/+ |
| 28. | Surgical Clinic, Healthy Carriers | III | 7/47/54/73/75/77 |
| 29. | Surgical Clinic Healthy Carriers | III | 52B/47A*) |
| 47. | Pediatric Clinic, Patient | III | 42B*) |
| 49. | Pediatric Clinic, Patient | **) | 52A/3A/3B/3C/55/71/73/75 |
| 61. | Pediatric Clinic, Dust | III | 6/7/47/54 |
| 62. | Pediatric Clinic, Dust | I | 52A/80 |
| 85. | Pediatric Clinic, Patient | III | 53 |
| 89. | Surgical Clinic, Healthy Carriers | **) | 52A/80/6/47/53/54/77/+ |
| 93. | Pediatric Clinic, Patient | III | 6/7/42E/47/54/73 |
| 101. | Pediatric Clinic Patient | III | 47/53/77/+ |

*) Supplementary test phages
**) Atypical phage composition

Table 3

Distribution of all Investigated Strains and their Enterotoxin Components within Various Lysogenic Groups

| Lysogenic | Patients | | Healthy carriers, Dust | | Total | |
|-------------------|----------|----------------------|---------------------------|----------------------|-------|----------------------|
| | Group | Enterotoxin positive | Group | Enterotoxin positive | Group | Enterotoxin positive |
| I | 34 | - | 30 | 1 | 64 | 1 |
| darunter „80/..“ | 31 | - | 23 | 1 | 54 | 1 |
| II | 5 | - | 3 | 1 | 8 | 1 |
| III | 7 | 4 | 10 | 4 | 17 | 8 |
| IV | - | - | 1 | - | 1 | - |
| M (miscellaneous) | 2 | - | 1 | - | 3 | - |
| Atypical | 3 | 1 | 4 | 1 | 7 | 2 |
| Indeterminable | 1 | - | - | - | 1 | - |
| Total | 52 | 5 | 49 | 7 | 101 | 12 |

From this data we can conclude:

1. The lysogenic-group information on staphylococci strains with a positive chick embryo test is consistent with data on enterotoxin producers elsewhere, and the frequency distribution of all the staphylococci strains within the various lysogenic groups corresponds to their normal distribution in Germany. Because of this it is our opinion that we should look forward to the goal of actually isolating enterotoxin-producing staphylococci from chick embryo tests.

2. We must concern ourselves not only with enterotoxin components from staphylococci isolated in pus infections but we must also search for the ubiquitous staphylococci among the staff and from material objects. Recently Schafer reported on the epidemiological problems associated with these conditions. From among the strains producing

enterotoxin investigated by us we can distinguish at least 6, but more likely 10, distinct from each other. From this it is not probable that we are dealing with an enterotoxic strain from a clinical environment.

For other reasons not the least of which is financial, investigation of additional strains for their enterotoxic potentiality and the completion of this study is not possible.

We have decided to offer for discussion the results already prepared, in order to stimulate further research, especially on the occurrence and the epidemiological significance of the enterotoxin strains in healthy carriers of staphylococci.

Summary

Out of 101 staphylococcus strains isolated from pus, healthy carriers, or from dust, 12 strains produced enterotoxin when tested in the chick embryo test of Kienitz and Preuner. Ten of these strains were phages of lysogenic group III. Lysogenic group I predominated among the staphylococci incapable of producing enterotoxin. Seven enterotoxic strains were isolated from healthy carriers and dust.

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